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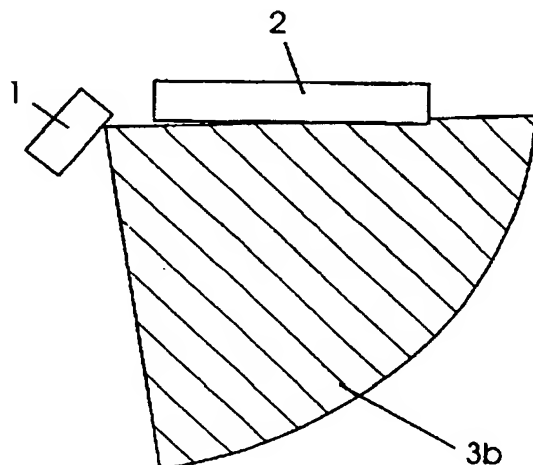
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(54) Title: VEHICLE MIRROR



(57) Abstract: A mirror assembly for an articulated vehicle (1, 2) in-
corporates an image sensor which detects a specific image on the trailer
so that as the vehicle (1, 2) turns left the image sensor maintains the
image in its field of view and the mirror is automatically adjusted to
maintain the driver's view.

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Vehicle Mirror

The present invention relates to mirrors for use with vehicles, particularly with articulated lorries or trucks.

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It is well known that exterior or wing mirrors in vehicles can have a blind spot where the field of view of the driver is limited by the configuration and set up of the mirror, size of vehicle, the position of the driver etc. and there have been many arrangements and adjustable mirrors which enable this blind spot to be overcome.

10

With articulated vehicles and vehicles which are towing other vehicles particular problems can arise. For example in a right hand drive articulated vehicle the left hand wing mirror is set up to provide the appropriate view down the left hand side of vehicle when the vehicle is being driven in a straight line. When the vehicle turns left this field of view will change as the front towing section of the vehicle on which the mirror is mounted turns at a different angle and in a different arc to the towed section. This can drastically reduce the field of visibility of the driver and will result in a much larger blind area.

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20 With articulated vehicles a significant proportion of serious and fatal accidents occur where the left hand side of the vehicle is the first point of contact and in the majority of these accidents lack of visibility is at least a contributory factor. In driving schools for heavy goods vehicles there are special accident prevention courses to try to overcome this problem.

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Attempts have been made to have mirrors which change their angle when the steering wheels of the vehicle are turned, but these involve complex mechanical linkages and have to be installed when the vehicle is built.

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We have devised an improved self adjusting wing mirror which can be fitted to any vehicle including articulated heavy vehicles.

5 According to the invention there is provided a mirror assembly for a vehicle, which mirror assembly incorporates a mirror having a reflective surface, a mirror adjusting means and an image sensing means whereby the mirror adjusting means is able to adjust the orientation of the reflective surface of the mirror in response to images perceived by the image sensing means.

10 The invention also provides a vehicle incorporating the mirror assembly and the invention is particularly useful in vehicle which are towing a trailer, caravan, boat, horse-box etc.

15 In use, the mirror is adjusted automatically in the normal way to give the driver the appropriate view in the reflective surface of his mirror and the image sensing means is set up to detect a specific image. When the vehicle turns, the specific image will start to move out of the field of view of the image sensing means, the image sensing means then adjusts itself so that the specific image stays in its field of view and this causes the mirror adjusting means to adjust the reflective surface of the mirror so as
20 to maintain the appropriate field of view for the driver.

Preferably the image sensing means and the mirror are directly attached to each other and the movement of the image sensing means and the reflective surface of the mirror are coupled so that, as the image sensing means adjusts to maintain the specific image
25 in its field of view, the reflective surface of the mirror is correspondingly adjusted.

The image sensing means can be in the form of a camera or other image detector or sensor such as a photodetector etc. Preferably the signals received by the image sensing means are digitised and are an input into a computing element such as an
30 electronic control unit etc. This computing element can control a moving means for

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the image sensing means such as a motor, so that the orientation of the image sensing means is controlled thereby. As the purpose of the image perceived by the image sensing means is only to detect the movement of a specific image, that being an image within which a trailer vehicle is visible, it has enhanced image recognition features to detect the trailer. In most cases the ability to detect a contrast in colour or brightness, such as at an edge, is adequate and the specific image detected can be an area of such contrast e.g. the end of the articulated section of the vehicle or a strip of bright or strongly reflective material stuck on the vehicle. Alternatively there can be a light or other distinguishable feature fixed to the vehicle for detection and this forms the specific image. This feature or light will be already existing on the trailer and be considered a standard component or part of the trailer.

The system can incorporate other detection software so that it can detect other road users, obstacles, persons etc. and can cause a warning signal or sound when such other road users, obstacles, persons etc. are detected, the warning can be incorporated in the mirror or it can be in the driver's cab etc.

The mirror adjusting means can be any of the conventionally used means which are widely used on vehicles to operate electrically mirrors from inside the vehicle. In the present invention the orientation of the reflective surface of the mirror is controlled by the orientation of the image sensing means instead of the driver of the vehicle.

There can be an indicator light which will be automatically activated when the mirror adjusting means and image sensing means are operating, this indicator light can be located at a convenient location e.g. in the mirror housing etc. The indicator light can be a steady light or it can flash in a manner similar to indicator lights.

Preferably the mirror assembly incorporates a means to transmit additional data to modules that are integrated to the vehicle's electrical system e.g. by direct cable connection or by infrared or wireless remote link. This would enable there to be, for

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example, supplementary control of the whole vehicle turn indicator circuit. This could come into effect when articulation is sensed and can activate the suitable turn signals on the vehicle. The turn signals on the vehicle can be activated independently of hazard warning or reversing light circuits or in addition to these lighting circuits. If
5 these a combination of these lights are activated together and an input from the mirror system indicator is sensed then these lights may be flashed together or in a preprogrammed sequence

If there is a remote link within the mirror this can also be used to transmit data
10 between a companion mirror fitted the other side of the vehicle. A rolling code would be enabled such that adjacent mirror systems on different vehicles will not interfere with each other. The positional adjustment of the companion mirror may be controlled from the transmitting mirror if this feature is fitted or the companion mirror may have its own image sensor fitted for independent control.

15 Preferably there is a remote control switch fitted within the cab that allows the driver to override the mirror system at will. The signal transmitted from this module to the mirror can be by a wireless link or can be wired into the vehicles power supply or powered by suitable battery device. The manual override control for the driver may
20 also allow for a driver controlled up-down adjustment of the reflective mirror to accommodate different size drivers of the vehicle.

The image sensing means can be rigidly mounted to the mirror housing so that adjustment of the mirror surface by the adjusting means will not alter the position of
25 the image sensing means. Alternatively the image sensing means can be mounted behind the mirror and connected to the mirror surface so that, as the mirror surface is adjusted, the visual field of view afforded by the image sensing means changes sufficiently to allow this. The image sensing means behind the mirror glass may be positioned such that it looks through the glass, or is positioned behind the plane of the
30 mirror but beyond the perimeter edge of the mirror. If the image sensing means looks

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through the glass the glass may be coated with a one way mirror material such that the imaging sensor looks through the glass but from the reflective side there is no interruption of the reflective surface.

- 5 In the embodiment in which the image sensing means is mounted above or below the mirror glass but still contained within the mirror housing, the housing may be required to have a slightly physical shape to accommodate the sensor in the lower or upper region of the mirror housing.
- 10 The mirror assembly of the invention can be retrofitted to vehicles in place of existing mirrors and, in the case of electrically operated mirrors, this is a simple straightforward replacement.

The invention is illustrated in the accompanying drawings in which :-

15

Fig. 1 shows an articulated vehicle driving straight

Fig. 2 shows an articulated vehicle turning left using a conventional wing mirror

Fig. 3 an articulated vehicle turning left using an embodiment of the invention as a wing mirror and

- 20 Fig. 4 shows an embodiment of a mirror incorporating an image sensor

In the drawings an articulated vehicle comprises a driving section (1) towing a trailer (2) in which the driver's field of view in the left hand wing mirror is shown by (3). In fig. 2 the vehicle is turning left and the driver's field of view is reduced to (3a). In fig.

25 3 with a wing mirror of the invention the driver's field of vision is expanded to (3b).

- Referring to fig. 4 a mirror assembly incorporates a reflective surface (4) in which there is a transparent opening (5) into which fits an image sensor such as a digital camera. The output from the camera is used to control a motor which turns the
- 30 reflective surface to control its orientation. As the towing vehicle turns left the image

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sensor controls the motor so that a specific image stays in its field of view and this automatically orients the reflective surface to maintain the driver's field of view.

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Claims

1. A mirror assembly for a vehicle, which mirror assembly incorporates a mirror having a reflective surface, a mirror adjusting means and an image sensing means
5 whereby the mirror adjusting means is able to adjust the orientation of the reflective surface of the mirror in response to images perceived by the image sensing means.
2. A mirror assembly as claimed in claim 1 in which the image sensing means incorporates an image sensor adjusting means so that, in use, the image sensor
10 adjusting means adjusts the image sensing means so that a specific image stays in the field of view of the image sensing means and the mirror adjusting means adjust the reflective surface of the mirror accordingly.
3. A mirror assembly as claimed in claim 2 in which the image sensing means and the
15 mirror are directly attached to each other and the image sensing means and the reflective surface of the mirror are coupled so that, as the image sensing means adjusts to maintain the specific image in its field of view, the reflective surface of the mirror is correspondingly adjusted.
- 20 4. A mirror assembly as claimed in claim 3 in which the image sensing means is mounted within the reflective surface of the mirror.
5. A mirror assembly as claimed in claim 3 in which the image sensing means is mounted behind the reflective surface of the mirror.
- 25 6. A mirror assembly as claimed in claim 5 in which the reflective surface comprises one way glass and the image sensing means is able to perceive images through the reflective surface of the mirror.

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7. A mirror assembly as claimed in claim 3 in which the image sensing means is mounted beyond the perimeter of the reflective surface of the mirror.
- 5 8. A mirror assembly as claimed in any one of claims 1 to 7 in which the mirror assembly incorporates a means to transmit additional data to modules that are integrated to the vehicle's electrical system by direct cable connection or by infrared or wireless remote link.
- 10 9. A mirror assembly as claimed in any one of claims 1 to 7 in which there is an indicator light which will be automatically activated when the mirror adjusting means and image sensing means are operating.
- 15 10. A mirror assembly as claimed in any one of claims 1 to 9 in which the image sensing means is attached to the mirror housing so that adjustment of the reflective surface by the adjusting means will not alter the position of the image sensing means.
- 20 11. A mirror assembly as claimed in any one of claims 1 to 9 in which the image sensing means is mounted behind the mirror and connected to the reflective surface so that, as the reflective surface is adjusted, the visual field of view afforded by the image sensing means changes sufficiently to allow this.
12. A mirror assembly as claimed in any one of the preceding claims in which the image sensing means is a camera or a photodetector.
- 25 13. A mirror assembly as claimed in any one of the preceding claims in which there is a computing element connected to the image sensing means and the signals received by image sensing means are an input into the computing element, there being a moving means for the image sensing means controlled by the computing element.

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14. A vehicle incorporating a mirror system as claimed in any one of the preceding claims.
- 5 15. A vehicle as claimed in claim 14 in which there is a companion mirror on the other side of the vehicle to the mirror assembly and there is a remote link between the mirror assembly and companion mirror which can be used to transmit data therebetween.
- 10 16. A vehicle as claimed in claim 15 in which the companion mirror has its own image sensor fitted for independent control.
17. A vehicle as claimed in any one of claims 14 to 16 in which there is a remote control switch fitted within the vehicle that allows the mirror system to be overridden.
- 15 18. A vehicle as claimed in any one of claims 14 to 17 which incorporates detection software able to detect other road users, obstacles, persons etc. and can cause a warning signal or sound when such other road users, obstacles, persons etc. are detected.
- 20 19. A mirror assembly as hereinbefore described with reference to the drawings.

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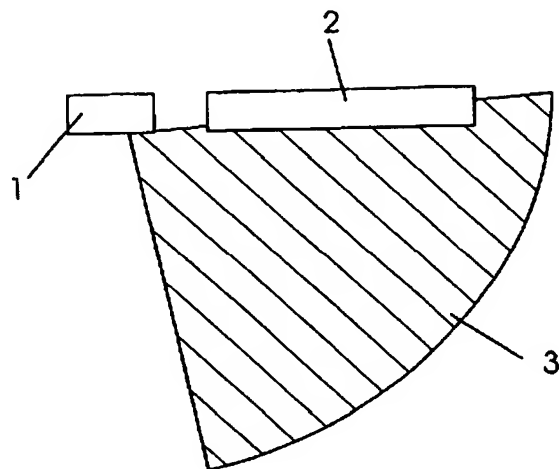


Fig. 1

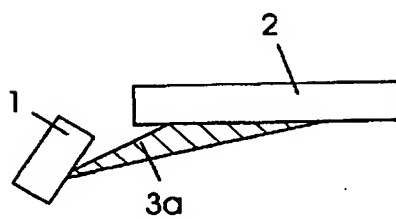


Fig. 2

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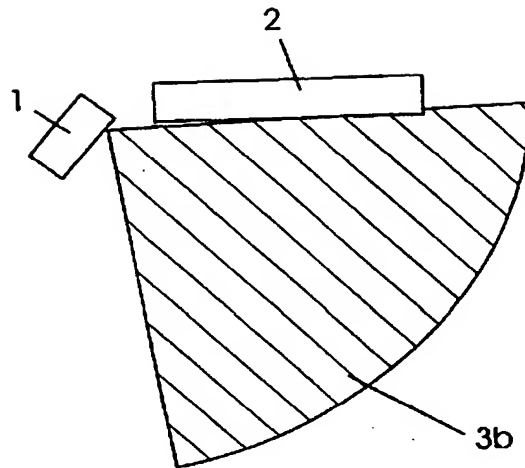


Fig. 3

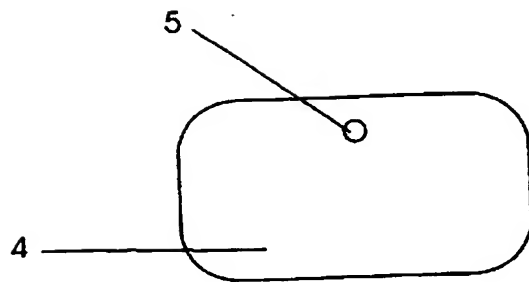


Fig. 4

INTERNATIONAL SEARCH REPORT

International Application No

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A. CLASSIFICATION OF SUBJECT MATTER
IPC 7 B60R1/02

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)
IPC 7 B60R

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practical, search terms used)
EPO-Internal

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	US 6 151 175 A (OSHA JONATHAN P) 21 November 2000 (2000-11-21) column 4, line 61 - column 5, line 9 column 4, line 1 - line 7 column 6, line 42 - line 66 claims 1,3,4,8,9,16,17 figures 3,6,9,10A,10B	1-3,7,8, 10-14,17
Y	---	4-6,9,18
Y	EP 1 022 191 A (MEKRA LANG GMBH & CO KG) 26 July 2000 (2000-07-26) abstract; figures 1,2	4-6,9
Y	US 5 765 116 A (APPLEYARD MICHAEL ET AL) 9 June 1998 (1998-06-09) abstract	18
A	column 6, line 57 - column 7, line 5; figures 3,9	12

☒ Further documents are listed in the continuation of box C.

☒ Patent family members are listed in annex.

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INTERNATIONAL SEARCH REPORT

International Application No
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C.(Continuation) DOCUMENTS CONSIDERED TO BE RELEVANT		
Category *	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 4 779 095 A (GUERRERI BART G) 18 October 1988 (1988-10-18) abstract; figure 2A ---	18
A	US 3 640 609 A (PROVENZINO ANDREW V ET AL) 8 February 1972 (1972-02-08) column 4, line 7 - line 34; figure 5 -----	15

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Form PCT/ISA/210 (continuation of second sheet) (July 1992)

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INTERNATIONAL SEARCH REPORT

Information on patent family members

International Application No

PCT/GB 02/02717

Patent document cited in search report		Publication date	Patent family member(s)	Publication date
US 6151175	A	21-11-2000	AU 6120200 A EP 1192417 A1 WO 0075609 A1	28-12-2000 03-04-2002 14-12-2000
EP 1022191	A	26-07-2000	DE 19903595 A1 BR 0000149 A EP 1022191 A2 JP 2000236468 A	24-08-2000 26-09-2000 26-07-2000 29-08-2000
US 5765116	A	09-06-1998	DE 69402278 D1 DE 69402278 T2 EP 0640903 A1 ES 2099544 T3 JP 7104850 A	30-04-1997 10-07-1997 01-03-1995 16-05-1997 21-04-1995
US 4779095	A	18-10-1988	NONE	
US 3640609	A	08-02-1972	CA 940421 A1 US 3527528 A	22-01-1974 08-09-1970

Form PCT/ISA/210 (patent family annex) (July 1992)